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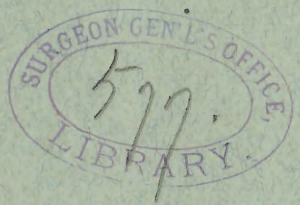
A Few Thoughts Concerning Fractures



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A FEW
THOUGHTS CONCERNING FRACTURES.*

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Any discussion of the subject of fractures may seem superfluous, particularly to surgeons; but these cases are mostly treated by the general practitioner, especially the country doctor. The results of treatment are often far from satisfactory in any hands, as the limb is almost never as perfect in function and shape as before. I do not for a moment wish to be understood to assume any degree of perfection in my knowledge, or a superiority in my results with such cases; fractures are a greater source of anxiety to me, probably, than any form of surgical work coming under my care. How many so-called "sprained wrists" come out stiff, with an, alas, too late but undoubted evidence of unreduced impaction! How many ankles are deformed and impaired through a broadened joint and an unreduced backward luxation of the foot! Such results are due partly to errors in diagnosis, but especially to a lack of knowledge of the lesions and the correct principles of treatment. Without multiplying examples, I think I may be pardoned for occupying the time of this society with a few thoughts concerning fractures.

The symptoms of fracture as ordinarily given in the books are too numerous to remember easily, and the average man looks for but one, *i.e.*, crepitus. As a matter of fact, crepitus is rarely necessary to a diagnosis, and the attempt to obtain it usually results in a flagrant violation of the golden rule of treatment, "be gentle."

The symptoms may be divided into two general classes, the subjective and the objective, of each of which there are three:

1. The history, pain, and loss of function;

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2. Deformity, abnormal mobility, and recurrence of the deformity after reduction.

In connection with the subjective symptoms, the method of examination is worthy of consideration. By quiet, systematic questioning to bring out the *history*, more than a tentative diagnosis can often be arrived at, to say nothing of quieting the patient's fears and winning a most necessary confidence. The character of the *pain* caused by the sharp ends of a broken bone, as distinguished from that of a luxation, a sprain, or a contusion, are familiar to all of us. The patient, too, may have felt a snap at the time of injury, or may describe the grating of the ends of the bone. *Loss of function*, present with but few exceptions, will also be brought out.

What can be more characteristic than the history of an old woman, a misstep, pain at the hip or referred down the thigh or to the knee, and usually complete loss of function. The diagnosis of intracapsular fracture only requires to be verified by looking for eversion of the foot, while the prognosis is settled by the presence or absence of shortening.

Under *deformity* come that of the limb, the local swelling and distortion, the late greenish-yellow ecchymoses, and the variations in length. In recognizing *abnormal mobility*, crepitus may incidentally be found. It is of use only in deep-seated or joint fractures where a diagnosis cannot otherwise be reached, and is more often to be looked for to prove the approximation of the broken ends during reduction. *Recurrence of the deformity* has but a very limited sphere.

The first step in the physical examination is *inspection*, which will show deformity, both local and of the limb. It is of much more value when supplemented by *comparison* with the other limb or the other side of the body. A positive diagnosis can very frequently be arrived at by this alone. Closely allied to it is *mensuration*, by which the comparative length of limbs and the circumference of parts, as well as the relation of the numerous test-lines, are made out.

So far there has been no laying on of hands, no pain caused, and in the vast majority of cases only corroborative evidence is required from *palpation*. Hence this must be intelligent, with a certain object in view, and, above all, *gentle*. Occasionally *percussion* is of value, as, for instance, in fracture of the inaccessible shaft of the fibula.

In considering special fractures, it may be well to take them up in regions, or according to their frequency rather than in the text-book order.

Colles's fracture is probably one of the most frequently met with. We are taught to associate this injury with the familiar "silver-fork" deformity, which, when present, permits of a positive diagnosis by inspection alone (Fig. 1).

But this deformity is, unfortunately, either wholly or partly absent in that form of fracture at the lower end of the radius, which is far more common than is generally supposed, the impacted fracture, the usual appearance of which is that of a sprain with typical effusion and often even tendon grating (Fig. 11). In the absence of swelling, a bunching up of the lower end of the radius may be made out; but if we wait for the effusion to be absorbed it is next to impossible to break up the impaction, the leverage on the lower fragment being so small. Hence I have made it a rule in a case of wrist sprain, with or without bone deformity, to etherize the patient and attempt to break up an impaction. If the bone be intact, no harm is done, but if an impacted fracture is present deformity and mobility are produced. This fracture is the exception in the treatment of impactions.

A corroborative symptom in the diagnosis is the prominence of the styloid process of the ulna, producing a tendency in the hand to fall to the radial side, and a broadening of the wrist (Fig. 2). This is due to laceration of the radio-ulnar and lateral ligaments. The lesion has a later importance, because fibrous tissue heals more slowly and less firmly than bone, for, at times, such a fracture will unite kindly, and the patient be discharged with an apparently perfect result only to return in a few weeks with a prominent ulnar styloid process and a consequent partial luxation of the wrist. It is but right to protect ourselves by warning patients against such a possibility, and to prevent it by means of a circular band.

Complete, accurate and early reduction of Colles's fracture is the all-important point in the treatment, some surgeons going so far as to advise no dressing, or, at most, a circular roller or adhesive strip. We should aim, besides, to preserve the arch under the radius, to prevent outward luxation of the ulna, and to keep the fingers moving to avoid tendinous adhesions. The

Levis perforated tin splint, or the Carr splint, probably accomplish this better than any other, while the popular Bond splint tends to break the arch down, but, as a matter of economy and universality, plaster-of-Paris splints are just as serviceable (Fig. 3).

Fractures of the clavicle differ from those we have just considered in that function is usually good, no matter what the deformity. The great variety of dressings, devised to overcome this deformity, prove that no one fills the bill satisfactorily. The displacement, "downward, forward and inward," is so well known that the indications for treatment are clear. Probably the most successful plan is that used in young women who are willing to lie still for a couple of weeks with a stiff pillow under the well shoulder.

As regards ambulant treatment, I must confess to a decided prejudice against the axillary pad as applied in the Fox dressing and all its modifications. I was led to try the posterior figure-eight because it was the only dressing a medical superintendent could keep on his patients in an insane asylum. I have found it of especial value in children, and the first adult on whom I used it, an engineer, was able to drive his locomotive throughout the treatment. This dressing has the disadvantage, to a degree, of the axillary pad, although the pressure can be relieved by carrying the arms from the side. A few weeks ago I was forced to modify the principle of the figure-eight in a fracture of the clavicle in which all of the ordinary dressings had failed to overcome the deformity, and in which wounds of the anterior axillary folds precluded the use of the figure-eight. The shoulders were drawn forcibly back until the over-riding was reduced, and held by a broad band of adhesive plaster, extending around from the front of one shoulder, across the back, to the front of the other. Fearing some drooping, I supplemented this with a sling of the elbow (Fig. 4).

In examining the shoulder, after the subjective symptoms are obtained, comparative inspection is of the greatest value—the hollow from dislocation, the extra joint in fracture at the neck, the sharp edge and depression of fracture of the acromion and dislocation of the scapula, and the positions of the arm in fracture and dislocation all being familiar. Then the comparative length of the arms is sought for by mensuration,

and to this is added the comparative circumference of the two shoulders and the external plane of the arms. Lastly, the hands are gently laid on to find whether the head of the humerus is in place and moves with the shaft, whether the arm is abnormally mobile or immobile, and to palpate the clavicle, the acromion, the scapular spine and body and the coracoid process in thin subjects.

For practical purposes the fractures at the upper extremity of the humerus may be considered as the intra- and extra-capsular. The former are obscure joint injuries, fissured, comminuted or impacted, and occur in the old, or are produced by severe direct violence. Joint effusion and inflammation quickly follow and more or less stiffness usually results. The diagnosis has to depend on the history, exclusion, absence of motion in the head if complete, and principally on the recognition of deep-seated crepitus. The treatment is to bind the arm to the side, a sling of the hand, and the ice-bag to the joint.

Fracture of the surgical neck and the adjacent epiphyseal separation of the young, as well as the numerous breaks of the shaft, are readily diagnosed, and the minimum of damage done by the plan of examination already given. They are all treated by the internal angular splint, shoulder-cap or outside moulded splint and a sling. Occasionally adhesive plaster extension is necessary, or, better, approximation is obtained by the principle of the Stromeyer pad and Middledorpf's triangle.

Two complications are to be looked for in fracture of the shaft: 1. Laceration of the musculo-spiral nerve or inclusion of the same in the callus, producing the characteristic wrist-drop; and, 2, non-union, which, as is well known, is apt to be progressive, resulting in extensive defects. Both of these may require operative interference: nerve suture or liberation; or, besides the usual measures for non-union, bone transplantation. Fortunately, shortening is not as disabling in the upper as in the lower extremity.

Fracture with dislocation is often a very troublesome injury. It may be a primary lesion or the break may be produced while reducing a dislocation. It usually occurs near the surgical neck, although it may take place within the joint. In the latter case little else can be done than remove the loose frag-

ment sooner or later; in the former the plan has been to get union and reduce the luxation afterwards if the primary attempts fail, to form a false joint, or to excise the upper fragment. McBurney has suggested an ingenious procedure which he has practised successfully. The upper fragment is exposed, a doubly-curved hook, with a long handle to give leverage, is introduced into a hole bored in the shaft, and the manipulations for the reduction of a dislocation are carried out. (He has since applied his plan to an ancient luxation without fracture, steadying the scapula with a similar hook inserted into its spine.)

Fracture of the neck of the scapula is looked upon as exceedingly rare, but I have not found it so. The symptoms are those of a downward dislocation, the arm, however, being, theoretically, limp at the side, instead of abducted and rigid. Reduction is easily accomplished by simply pushing the arm up or by the usual manipulations for a subglenoid luxation; but the deformity recurs and crepitus is elicited. That recurrence of deformity is not to be looked upon as pathognomonic is shown by some of the consecutive dislocations we meet with. I recall a case of subclavicular luxation which was brought to the subcoracoid position and then reduced by the Kocher method. On moving the arm the dislocation recurred, and was only completely reduced by first drawing the head into the axilla and then replacing it. The primary luxation was subglenoid, the secondary subcoracoid, and finally subclavicular. Such journeys are not uncommon. I feel that it is worth while to urge attention to the Kocher method in anterior luxations, and the principles of reduction by manipulation in the downward and very rare backward dislocations, in view of the uncouth means so frequently employed.

The elbow is the peer at least of the shoulder in difficulties and in the number of its injuries; the surgical points being the position of the head of the radius, the inter-condyloid test-line, and mensuration of the arm and forearm.

Transverse fracture of the humerus, and its analogue, the separation of the lower epiphysis in children (Fig. 13) closely resemble backward dislocation of both bones, and some teach that recurrence after reduction is the distinctive point. With

a chipped-off coronoid, a luxation, however, recurs. True, they are both reduced on the principle of traction in the direction of the deformity, but a diagnosis ought to be made before manipulations are begun. The relation of the head of the radius to the external epicondyle, and of the olecranon to the inter-condyloid test-line, the shortening of the arm in fracture and of the forearm in dislocation, will serve to distinguish most cases. Retention in either instance is accomplished by the anterior angular splint at first, and later by the internal angular.

Fractures of the internal condyle, aside from entering the joint, owe their importance to their tendency to destroy the carrying power of the arm, producing the well-known gun-stock deformity. They are recognized by obtaining independent mobility or deep crepitus and deformity, the fragment being forward while the ulna is displaced laterally. Considerable discussion has arisen as to whether they should be treated in the flexed or extended position. Personally I prefer a straight splint shaped on the well side to follow the carrying curve. This is turned around and applied to the injured limb with a generous padding opposite the joint to avoid complete extension (Fig. 5). In the course of two or three weeks an anterior, or, better, an internal right-angled splint can be substituted. In case of stiffening, the forearm is thus nearly in the ideal position for a stiff elbow.

The same splint, similarly padded, answers very well for fractures of the olecranon, aided, perhaps, by a retentive strip of adhesive plaster. I have on several occasions met with a fracture of the olecranon within the fibrous expansion of the triceps and without, at least, primary displacement. This should be looked for in injuries in this region. If compound or comminuted, fractures of the upper end of the ulna had better be wired.

The same violence that produces a Colles's fracture may fail at this point and splinter the head of the radius against the capitellium humeri. A much more important injury is the subluxation of the head of the radius produced by the common practice of lifting a child across a gutter by the hand; it cries and refuses to use the arm. Attention is not called to the injury, or it is overlooked by the physician. The deformity is

slight flexion and pronation, with the head of the radius a little low. Reduction is accomplished by extreme supination, after which the arm is rested on an internal or anterior angular splint.

Fractures of the forearm are readily made out, the subcutaneous ulna and the non-rotating head of the radius, together with comparative mensuration of the bones, being the gentle, objective means of diagnosis. Interosseous callus, destroying pronation and supination is to be feared, and may be prevented by the position midway between the two, that is to say, on an internal angular splint with a straight dorsal one and the thumb pointing upward. Also by using wide splints, which do not allow lateral pressure by the bandage. Interosseous pads and non-elastic or tight dressings are to be avoided on account of the well-known tendency to gangrene in the forearm. This is probably due to the presence of what might be termed an internal splint formed by the two bones and the unyielding interosseous membrane.

Unnecessary though it may seem to some, I will take occasion in this connection to deprecate the use of the too frequently applied preliminary bandage. Its only sphere is to support the parts below a splint.

An exception to the above-mentioned position is met with in fractures of the radius above its middle, or above the insertion of the pronator radii teres. The supinators are not resisted, and the upper fragment besides being flexed, is rotated outward. Hence the primary dressing must be an anterior angular splint, the ideal internal angular being substituted later on.

It is worth while to remember that the radius is not only broken higher up than the ulna, but that its head is likely to be dislocated, forward most frequently, in fracture of its fellow.

About the ankle, the most common fractures are Pott's and those associated with sprains, "the sprain fractures." The latter owe their importance to the fact that they are overlooked and treated as sprains, the displacement being left unreduced, and stiffness of the joint, with subsequent eversion or inversion of the foot, resulting. In every case of sprain the malleoli should be carefully examined. If one is found to move, it is accurately "set," inflammation is controlled by the ice-bag,

with the foot in a fracture box, and then a plaster cast applied during the balance of the healing.

Gibney has advocated the early or immediate use of adhesive plaster in sprained ankles. From an extended experience, I can most heartily endorse his plan, and have carried it farther by applying it to "sprain fracture." The foot is put up as for a sprain, particular attention being given to the strips over the broken malleolus, so as to hold the fragment in place. A starch or plaster cast is added, this being the only difference from the treatment of a sprain.

As regards Pott's fracture, Stimson has emphasized the resulting lesions, and suggested a valuable method of treatment, based upon an intelligent understanding of the same. The lesions are:

1. A fracture of the fibula two or three inches above the malleolus.

2. A break at the outer side of the lower end of the tibia, or a laceration of the tibio-fibular ligament.

3. A chipping off of the inner malleolus, or a laceration of the internal lateral ligament.

As a result, the foot is everted and displaced backward. The joint is broadened, both antero-posteriorly through the backward luxation, and laterally through a widening of the tibio-fibular mortice (Figs. 6 and 7).

By means of the Dupuytren splint, which is harsh and apt to make damaging pressure, the eversion is corrected, but the backward displacement is not necessarily overcome; in consequence, flexion of the foot is permanently impaired.

Reduction is accomplished by grasping the leg with one hand, taking the sole of the foot in the palm of the other. The foot is drawn forward and turned inward beyond the normal position. If chipped off, the inner malleolus is manipulated into place, and it is very apt, sooner or later, to break through the skin. The retentive dressings consist of a posterior plaster-of-Paris splint from below the knee to beyond the tips of the toes. This prevents backward displacement. The inversion is held by a similar splint, starting on the dorsum of the foot, running around its outer side, across the sole and up the inner side of the leg to a corresponding height. They are

held in place by a few circular turns at the foot, ankle and the upper end. In the course of three weeks a cast can be substituted, which gives the patient more freedom.

In my service at the Hahnemann Hospital and Dispensary, fractures of the upper extremity are almost all treated as out-patients. So crowded are the wards by the large accident material, that we keep most fractures below the femur but ten days or two weeks as in-patients. Fractures of the leg are put up in a fracture box with an ice-bag, and, as soon as the swelling is controlled or the wounds are healed, they are sent out in a cast and on crutches. One or two diagnostic points may be worthy of mention. The subcutaneous tibial crest makes the recognition of solutions of its continuity plainly visible or tangible to a gently palpating finger. Shortening can be recognized by seating the patient in a chair with the legs bare, and comparing the height of the knees (Fig. 8). Loss of function, *i.e.*, power to walk, is not necessarily absent even in fracture of both bones of the leg. Excessive manipulations to make out a coincident break in the fibula should be avoided. Percussion at one end of this bone, with a finger at the other, or pressure at one end to elicit pain at the point of fracture, will often settle the question. In fractures of the tibia a possible luxation of the head of the fibula should be looked for. I know of more than one instance in which this oversight has caused trouble for the physician.

The most frequent fractures about the knee are those of the patella (Fig. 9). The treatment of this lesion has, of late years, excited considerable discussion, and some have tried hard to popularize direct or indirect suture of the bone. In an impartial article, Bull has voiced the sentiment of most conservative surgeons, which is, that in spite of the improved methods of wound treatment, accidents do occur; that the union obtained is not, as a rule, as strong or any more serviceable than the fibrous union, even of considerable length, resulting from splint treatment, which is certainly the method for the great majority of practitioners. Operation is indicated in compound fractures, in refracture and in bad function from long fibrous union.

The treatment consists of the inclined plane and ice-bag at

first, then a removable cast, in which the patient can go about on crutches, up to six weeks, and a posterior splint for six more; some protective apparatus for three months, and care, with gradual restoration of flexion to the end of the year.

I have used Gibney's adhesive treatment considerably and with gratifying results in the sprains of the knee so common among football players nowadays, and have applied the same dressing to fractures of the patella, adding the cast, of course. The use of adhesive plaster, by the way, can be extended to sprains in any part of the body, even to those annoying ones of the back. In these sprains, and particularly in fractures of the patella, the most important point is to prevent atrophy of the quadriceps extensor, some surgeons almost ignoring attempts at union for this.

I cannot leave the subject of the patella without referring to an oft-forgotten principle, simple though it may be, in the reduction of dislocations of this bone, *i.e.*, that it is a part of the quadriceps tendon. I have on several occasions been called to reduce luxations of the patella which had resisted pushing, pulling, twisting, and mauling for hours, By extending the leg and flexing the thigh it has of itself slipped into place.

A much more severe injury is the transverse fracture (rarely an epiphyseal separation) of the femur above the condyles. By the action of the gastrocnemius the lower fragment is apt to make destructive pressure upon the popliteal vessels. In my observation diagnostic manipulations and those directed towards reduction without recognizing the mechanism of the displacement have in several instances resulted in gangrene. Relaxation of the muscle by flexing the leg and the double inclined plane, aided at times by tenotomy of the tendo Achillis, and, above all, gentleness have been successful in my hands.

The presence of a longitudinal fracture making a T and entering the joint, or severe inflammation of the adjacent joint, are not infrequent complications, and require that the limb be put as soon as possible into the best position for a stiff knee.

There are two fractures at the hip which are both common and troublesome if not treated properly, the intracapsular, or more correctly, intra-articular, and the extra-capsular or extra-articular. Before considering these, let us recall for a moment

the surgical points at the hip: Nelaton's test-line and Bryant's triangle to get the comparative height of the trochanters; the arc of rotation to obtain the comparative length of the femoral necks; mensuration for the comparative length of the two limbs; Allis's test for the rigidity of the fascia lata; and the position of the limb, and particularly of the foot—everted, inverted, fixed.

Intracapsular fracture is at first a partial one according to some, an impaction according to others. In a classical case the diagnosis is made by the history: an aged patient, usually a woman, a slight fall and indirect violence; by the pain at the hip, or more often down the thigh to the knee, frequently associated with muscular spasms; and by more or less loss of function. Inspection shows eversion of the limb; mensuration and the test-lines are practically negative. No other symptoms are necessary. Complete fracture, as shown by mensuration, Nelaton's and Bryant's lines, shortened arc of rotation, recurrence of the deformity, etc., indicates that treatment with a view to obtaining union is useless, and that comfort and preservation of life alone should be looked for.

If we do not try to know too much, and if the above treatment is carried out successfully, union of incomplete fracture in my experience has been the rule, and aside from the results of osteophytes and rheumatoid pains, function has been restored.

The same applies in a less degree to extra-capsular fractures. If impacted, as they usually are, and Nature has not splinted the limb in a useless position, her work should be left alone. The history is usually that of a younger patient, a direct and greater violence, localized pain and tenderness and less impairment of function. The trochanter is raised, the arc of rotation somewhat reduced, the limb perhaps slightly shortened, and the foot everted and more or less fixed. Abnormal mobility and crepitus are, of course, unnecessary, and attempts to obtain them dangerous.

In no class of fractures is a systematic and progressive examination, stopping even with a tentative diagnosis rather than do harm, of greater preventive value than in those of the hip. Especially is this true because we are unable to say positively whether the break is inside or outside the joint in any given case.

Just below the hip, in the upper third of the thigh, is a fracture which often comes out badly. We are taught to treat these fractures with a flexed thigh, to raise the lower to the upper fragment, which is acted upon by the psoas and iliacus muscles. The deformity I have been troubled with during union has been a bowing outward, so that I have come to treat them with an inclined plane and an external splint, bringing the thigh down to the bed as soon as possible and continuing the long external splint with a steadying cross-piece at the foot.

Fractures of the femur in children I have treated by the excellent Hamilton splint, vertical suspension in the very young, and in the new-born by bandaging the thigh to the abdomen with anterior and posterior coaptation splints (Ellefsen).

I am frequently asked by recent graduates and practitioners to make them out a list of splints necessary for the average emergency. How many of us have been cajoled or browbeaten into buying complete sets of carved, felt, or other splints, which never fit the patients we try them on. The best use I have ever seen for such an armamentarium is that it was put to by a well-known colleague. He arranged and locked them in a plate-glass case in his front office and threw away the key. So, too, with the numerous internal and anterior and other wooden splints which are sold in the instrument shops. They have to be cut off to fit each case, and are thereafter unfit for any other. As a matter of convenience, as well as economy, I have had made a couple of metal pieces, one a rectangle and the other bent at a right angle, perforated with screw-holes, at a cost of 20 to 30 cents each (Fig. 10).

For a mere trifle any carpenter can make up a lot of thin pine boards, say 3, $2\frac{1}{2}$ and 2 inches wide, and 18, 15, and 12 inches long respectively. The boards are cut to fit the limb and thrown away after union is complete, the metal pieces being used over and over again. With these boards, metal pieces, a few screws, a screw-driver and a small saw, in a cloth "lawyer's bag," we have a complete and inexpensive splint armamentarium.

For instance, two boards of appropriate length held together by a rectangular piece of metal make the ideal internal angular, or, held by a right-angled one, the anterior angular splint (Fig.

10). By sawing one end to the requisite angle and uniting two boards with the straight holder, we can make a splint corresponding to the carrying power of the arm (Fig. 5). So, too, for the lower extremity, we can unite boards with the rectangular holders and fasten another across the lower end with the right-angled pieces, making a Hamilton splint, or unite several boards or bed-slats and attach a steadying cross foot piece in like manner for a long external splint. Short coaptation splints are either made by several of the narrow boards, by incorporating the same in a piece of cloth on the principle of the well-known dish-mat that rolls up, or by pieces of heavy cardboard. The last-named will also serve, as is well known, for the shoulder-cap and chin-trough. Plaster-of-Paris bandages, either prepared fresh or kept in hermetically-sealed boxes, will enable us to make all the moulded splints and every kind of cast. There only remain adhesive plaster, roller bandages and handkerchiefs.

I cannot leave the subject of fracture without referring to the treatment of the open or compound. While the general practitioner may decline to operate for an urgent appendicitis, a strangulated hernia, a broken skull, or even an emergency tracheotomy, while he may refuse to set and wire the fragments in a bad compound fracture, he is not excusable if he does not render such first aid to the injured as will prevent wound sepsis and make it possible to transform a compound into a simple fracture.

I well remember a bad compound fracture of the leg in the child of a prominent man in this city, which I was unable to see until the day after the accident. The attending physician had scrupulously disinfected the wounds and their vicinity both mechanically and chemically, and had occluded them with a bichloride dressing kept wet—nothing more. When the father complimented me on the result later on, I explained to him that it would have been impossible but for the intelligent preliminary treatment. And yet how often do ethics oblige surgeons to take the blame for suppuration, necrosis, deformity, and even loss of limb and life, when this very preliminary attention is neglected. In my experience, both in hospital and private practice, the transformation of a compound into a simple fracture has been the rule under such preliminary

treatment, and the fragments have usually been even more accurately set and held in place on account of the inspection, direct manipulation and internal splinting with silver wire, made possible by the wound. The details of a conscientious and painstaking antiseptic purification and occlusion are too well known to require repetition here. By such means alone can a complete condition of asepsis be induced in emergency practice.

Within a few months, a most valuable aid to the diagnosis and treatment of fractures has been developed in the X-rays, and particularly by the addition of Edison's fluoroscope. While I was enabled to obtain the well-known results in radiography, by means of the fluoroscope the apparatus has come to be of daily use in my office. The great drawback to the general adoption of the Roentgen rays is the expense; this I found to be particularly the case in the beginning of the *furore*, when I bought my first outfit. At the present rate of decrease, however, it will not be long before radioscopy will be available to all. The diagnosis of all fractures of the extremities is much facilitated, and, what is of more value, the position of the fragments can be inspected with the fluoroscope after the application of non-metallic splints. Subsequent taking down of the dressings, with its accompanying pain and disturbance, can thus be often avoided. So, too, the approximation of the fragments can be accurately accomplished under the guidance of the eye. Subjoined are a few illustrative radiographs (Figs. 11–14).

I have also observed what was, to me, a new property of the X-rays, a therapeutic one. The pains of periosteal and bone injuries seem to be arrested temporarily, at least, by their action. Whether such results will be permanent or not, time alone can show, but I have enough evidence to satisfy me that the plan is worthy of a more extended trial.

Since this paper was read I have had abundant opportunity to observe some of the trophic changes produced by the X-rays, in those who have been in frequent proximity with my outfit. They corroborate the recorded observations, such as blistering, gangrene, or atrophy of the skin; loss of hair in the hand, changes in the finger-nails, disturbances of vision, etc.

Fig. 1 is a Colles's fracture of the left radius, in a young and rather thin subject, taken immediately after the accident and before swelling had set in.

Fig. 2 is also a Colles's fracture, in a powerful man, some hours after the injury, and, therefore, the ulnar styloid process is not as prominent as it was at first. The displacement of the hand to the radial side has not been reduced by the weight of the arm, which is held up by the fingers.

Fig. 3 represents the plaster-of-Paris splints which have been allowed to harden on the limb while the deformities were held reduced. They are made by folding a wet plaster bandage forward and back to the desired length until the requisite thickness is obtained. It will be noted that the hand is carried to the ulnar side and that the arch under the radius is well supported. The padding has been purposely omitted to give a better view of the splints.

Fig. 4 is the dressing, for fracture of the clavicle, of adhesive strips to pull the shoulder backward and outward, while it is held up by the Moore handerchief sling, the application of which is readily seen.

Fig. 5 shows the adaptation of the writer's splint, shaped to preserve the "carrying power" of the arm, in a fracture of the internal condyle of the right humerus. The padding and bandage have been omitted for obvious reasons.

Figs. 6 and 7 were taken just after the admission of a patient to the Hahnemann Hospital, who had sustained a Pott's fracture of the left ankle. In spite of the position of the limb, in Fig. 6, which partially reduced the backward luxation of the foot, the lower anterior edge of the tibia and fibula is still noticeable above the joint, The outward displacement of the foot appears in Fig. 7.

Fig. 8 is the photograph of an old fracture of both bones of the lower third of the left leg. It shows the difference in length between the limbs, obtained by seating the patient in a chair and comparing the height of the two knees. The ankle is broadened and the fibular malleolus is prominent. A well-marked *hallux valgus* and *hammer-toes* can also be seen on the injured side.

Fig. 9 was taken from a fracture of the left patella before effusion had obscured the lesion. The deformity has been intensified by partially flexing the leg.

Fig. 10 shows the writer's metal plates and the internal and anterior angular splints made by applying them to boards which may differ in length and width, according to the patient. Fig. 5 is another application as described.

Fig. 11 cleared up the condition in an obscure, impacted Colles's fracture treated in the orthopædic out-patient department of the Hahnemann Hospital. The skiagraph was taken by an exposure of two minutes with a 6-inch coil supplied by storage batteries.

Fig. 12 was taken with a 10-inch coil, storage battery and three-and-a-half minutes' exposure. The patient, a child of four years, had sustained an epiphyseal separation at the lower end of the humerus, which had presumably been reduced. The splint, padding and bandage were in place, and the diagnosis was readily made with the fluoroscope. The olecranon epiphysis gives the impression of a separation there.

Fig. 13 shows an accurately set fracture of the tibia as seen through the dressings. The posterior perforated, metallic trough throws a distinct shadow. The skiagraph was the result of an hour's exposure, and was taken in March last with a 3-inch coil and the street current.

Fig. 14 enabled us to arrive at a diagnosis in a doubtful injury to the radius with localized pain, but no mobility. An impacted fracture is easily recognized. The skiagraph was taken last April with a 5-inch coil, the street current and 15 minutes' exposure.

FIG. 1.—Colles's fracture; silver fork deformity.

FIG. 2.—Colles's fracture; prominence of ulnar styloid; radial luxation of hand.

FIG. 5.—Straight anterior splint shaped to preserve "carrying power" of arm; padding omitted.

FIG. 3.—Colles's fracture; plaster-of-Paris splints; padding omitted.

FIG. 4.—Fracture of right clavicle ; adhesive plaster and sling dressing.

FIG. 6.—Pott's fracture; backward displacement of foot; antero-posterior broadening of ankle.

FIG. 7.—Pott's fracture; eversion of foot; widening of tibio-fibular mortice.

FIG. 8.—Comparative height of knees, to show shortening of leg.

FIG. 9.—Fracture of left patella, showing typical deformity produced by moderate flexion of leg and thigh.

Fig. 10.—Internal and anterior angular splints ; rectangular and right-angled metal pieces.

FIG. 11.—Impacted Colles's fracture.

Fig. 12.—Separation of lower humeral epiphysis, as seen through the dressings.

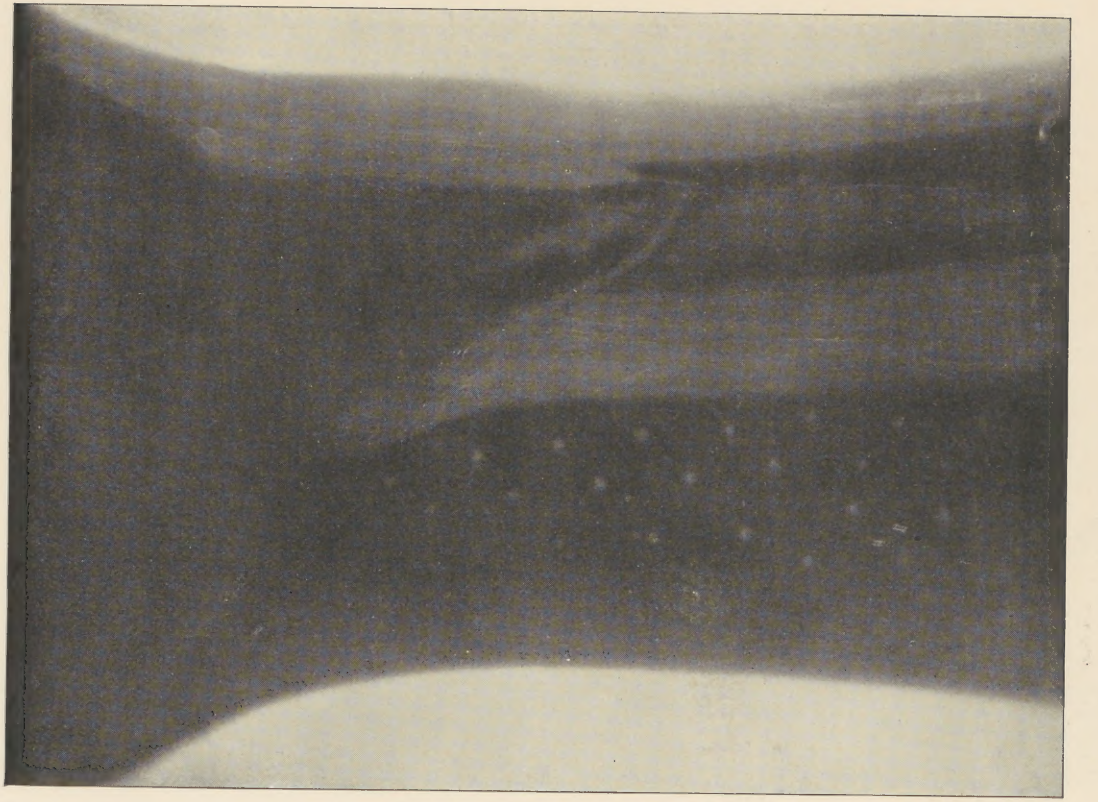

FIG. 13.—Fracture of tibia, reduced and dressed.

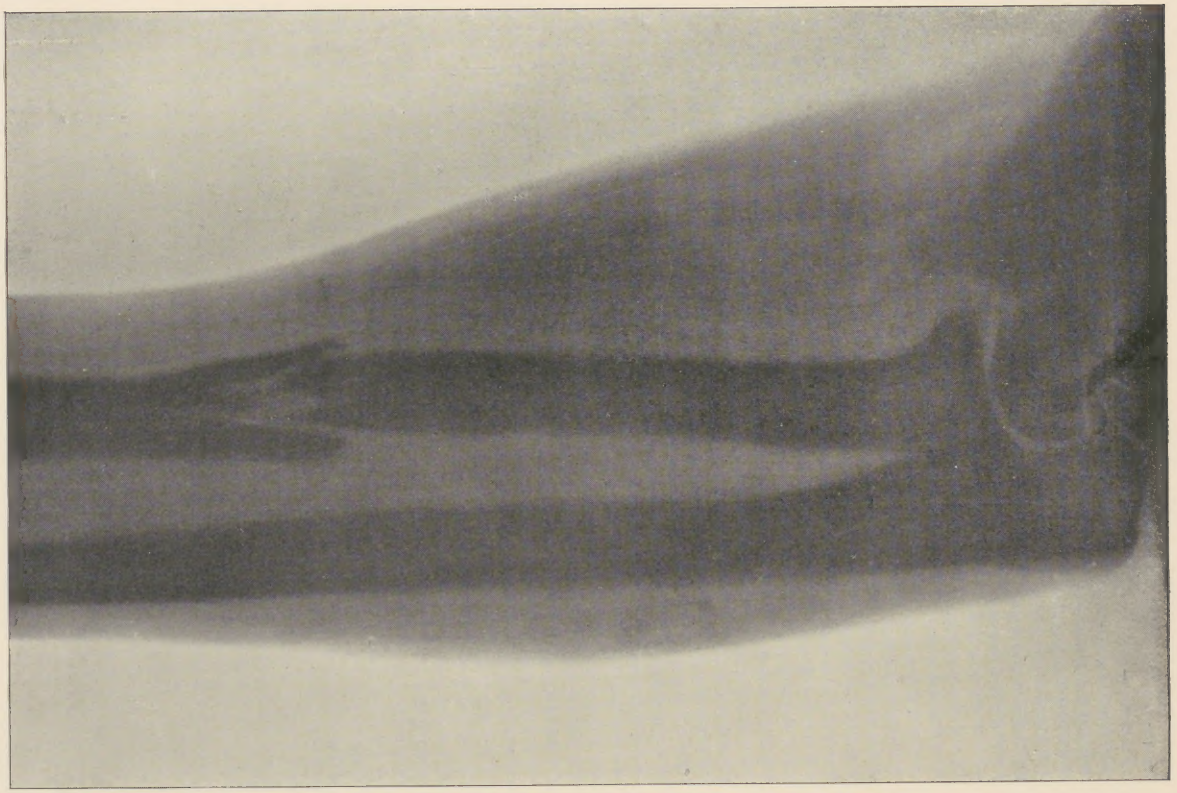

FIG. 14.—Impacted fracture of radius.